Riparian Woodland

Riparian Woodland

[Existing conditions inventory maps and photographs follow this section]

Introduction

The Grant-Kohrs Ranch Riparian Woodland is comprised of thick woodlands and wetland areas contained within the Clark Fork River, Cottonwood Creek, and Johnson Creek floodplains. While other riparian areas of the ranch are not entirely contained by fences, such as No Name Creek, the riparian areas along the Clark Fork River, Cottonwood Creek, and Johnson Creek have been fenced off for several years. As a result, vegetation within these areas has been allowed to grow without active cattle grazing.

Natural Systems and Features

[see Map EC-33 at the end of this section]

The headwaters of the Clark Fork River originate from the confluence of many creeks located approximately 19 miles south of the ranch near Anaconda. The principal tributaries are Warm Springs Creek and Silver Bow Creek. From here the river flows north through Deer Lodge Valley, where its tributaries join it after draining the upland areas and mountain ranges to its east and west. After traversing the Grant-Kohrs Ranch, the Clark Fork River winds its way north, eventually passing through Missoula on its way to Pend Oreille Lake and eventually the Columbia River (see Photo 3-7-1).

There are several natural water features within the riparian zone. Three natural springs source a 300 foot long slough located to the west of the Clark Fork River, just to the south of the Clark Fork River Bridge Road (see Photo 3-7-2).

Cottonwood Creek is a significant tributary of the Clark Fork River (see Photo 3-7-3). This creek begins in the foothills of Deer Lodge National Forest, and flows west into the City of Deer Lodge. Although the channel itself remains open, its floodplain has been developed within the town boundaries. The creek passes through culverts underneath the railroad corridor before flowing into the Ranch and along the southern boundary of Stuart Field. Large cottonwood trees shade the creek in this area, and several small dams have been constructed along its length, showing evidence of beaver inhabitation. Remnants of historic fencing are also in evidence here.

Johnson Creek is a more minor tributary of the Clark Fork. It begins just to the east of Interstate 90, where it flows south of the visitor center complex. After passing under the railroad corridor, it is supplemented by a natural spring before heading northeast through the home ranch complex.

The land associated with these riparian woodlands is very flat. It consists of very deep and poorly drained alluvial soils that are comprised of materials washed down from upriver and deposited on the floodplain.

Vegetation

[see Map EC-33 at the end of this section]

Riparian woodlands are by far the most ecologically diverse area of the park. These areas serve as a transition area between the aquatic and upland ecosystems, and their vegetation patterns

contrast vividly with the wet meadows and upland grasses found throughout the rest of the park.[1] Based upon information collected in a 2002 vascular plant survey, the riparian woodland along the Clark Fork River is dominated by 185 different species of shrubs, trees, grasses, and forbs (54% of the species documented on the ranch), and comprise 22 different community types.

The predominant species found within this area are shrubs, such as the geyer willow (*Salix geyeriana*), water birch (*Betula occidentalis*), sandbar willow (*Salix exigua*), western snowberry (*Symphoricarpos occidentalis*), Bebb willow (*Salix bebbiana*), and woods rose (*Rosa woodsii*); perennial grasses and forbs, such as smooth brome (*Bromus inermis*), Baltic rush (*Juncus balticus*), redtop bentgrass (*Agrostis stonlonifera*), and beaked sedge (*Carex utriculata*); and trees such as the black cottonwood (*Populus trichocarpa*) and Rocky Mountain juniper (*Juniperus scopulorum*), (see Photo 3-7-4).[2] Most of the predominant trees and shrubs in this zone are native, while several of the grasses, such as smooth brome and redtop bentgrass, are exotic.

These water-tolerant species, as well as obligate species such as the cattail (*Typha latifolia*), are also found in the riparian areas along Cottonwood and Johnson Creek, the wetland (abandoned sewage lagoon) located within the northern portion of the park property (see Photo 3-7-5), as well as in the oxbow cutoff, spring-fed sloughs, and the railroad barrow pits.
Riparian plant communities are the most diverse plant communities in the park; they provide food and habitat for waterfowl, hawks, great horned owls, great blue herons, muskrats, beaver, and a variety of other birds and mammals, such as white-tailed deer, squirrels, mice, skunks, and cottontail rabbits.[3] Before this area was fenced off, it also provided livestock shelter and shade, particularly during winter calving.

Growing almost 100 feet tall, the cottonwood trees are the most visually significant forms within the park and contrast strongly with their context. They stand out as focal points along the river, and in the fall their leaf color changes from green to gold. This tree species, like many native species found within the Deer Lodge Valley, is also culturally significant. Several native Indian tribes such as the Flathead, Kootenai, and Blackfeet, depended upon the cottonwood for sap, firewood, dye, and medicine.[4]

Spatial Organization
[see Map EC-34 at the end of this section]

The spatial organization within the riparian woodland is characterized by the trees and shrubs found there, along with the perimeter fences that are intended to keep livestock out of these areas. While some areas of this woodland are quite dense with trees and shrubs, other areas within the riparian zone are open grassland (see Photo 3-7-6).

Within the Clark Fork River riparian woodland, many open areas are associated with "slickens." These are areas of highly concentrated and exposed tailings where no vegetation can survive, and will be discussed in more detail below (see Photo 3-7-7).

[1] Peter M. Rice and Janet G. Hardin, "Vascular Plant Survey of Grant-Kohrs Ranch National Historic Site" (Missoula: University of Montana, 2002), 2.
[2] Rice and Hardin, 8.
[3] Rice and Ray, 28; Ray, 4.
[4] Jeff Hart, *Montana Native Plants and Early Peoples*, (Helena: Montana Historical Society Press, 1992), 131.

Land Uses
[see Map EC-34 at the end of this section]

Although portions of the riparian woodland were fenced beginning in the early 1980s, the entire riparian woodland was fenced in 1994 (primarily the northern portions) due to contamination concerns for staff, visitors, and livestock, and to protect the vegetation that is contained there. The uses associated with these areas include conservation of soil and riparian plant communities and flood protection, as well as visitor interpretation/education which was provided via the Cottonwood Trail.

Since the late 19th century, mine tailings containing heavy metals such as copper, lead, zinc, cadmium, and arsenic washed down the Clark Fork River and its two main headwater tributaries from ore mining and smelting areas upriver, specifically Butte and Anaconda. These tailings have accumulated throughout the floodplain and in some areas, settled in deep deposits along the banks of the Clark Fork River. These deposits, known as slickens, are areas of highly concentrated and exposed tailings where no vegetation can survive. Slickens are defined as "an undifferentiated soil type consisting of accumulation of fine-textured materials, such as are separated in placer-mine and ore-mill operations. Slickens from ore mills consist largely of freshly ground rock that commonly has undergone chemical treatment during milling or smelting processes."[5] Although slickens are the most visible indication of the presence of contaminants, mining-related wastes are not limited to slickens areas. Mine tailings are present throughout the floodplain, with the highest concentrations located in buried material to depths of approximately four feet.[6]

Several significant environmental hazards are associated with these contaminated areas, specifically: accelerated bank erosion and channel migration; vulnerability of the floodplain to destabilization (i.e. river braiding); hazards to terrestrial and aquatic life; degraded groundwater and surface water quality; and poor agricultural productivity.[7] In a map comprised of data compiled by the University of Montana (Moore et. al. 2002), it is evident that the river channel has moved as much as 120 feet in some areas between 1947 and 2001.[8] Significant floods during this time period (based on data compiled since 1978), have raised the river velocity to over 1000 cubic feet per second in June of 1980, 1982, and 1997 (the average monthly stream flow for the wettest month is 508 cubic feet per second).[9] This flooding, and subsequent channel movement, has exposed bank tailings in some segments, deposited them in others, and severely eroded the bank's river channel.

In the 2002 report published by Peter Rice and Janet Hardin, it is stated that although rivers are naturally dynamic in nature, "increased erosion and channel migration pose potential hazards if tailings deposits are exposed in unstable streambanks. Material eroded from the tailings will be redeposited elsewhere…maintaining the integrity of ecological processes and the natural riparian

[5] Peter M. Rice and Gary J. Ray, "Floral & Faunal Survey & Toxic Metal Contamination Study of the Grant-Kohrs Ranch National Historic Site," Referenced in text as Soil Conservation Service definition (Missoula: Gordon Environmental Studies Laboratory, Botany Department, University of Montana, May 1984), 5.
[6] Written comments provided by NPS personnel for 50% draft review, May 12, 2003; Moore, "Geologic, Soil Water and Groundwater Report-2001" (Missoula: University of Montana, 2000).
[7] U. S. Environmental Protection Agency, "Superfund Program Clean-up Proposal: Clark Fork River Operable Unit of the Milltown Reservoir/Clark Fork River Superfund Site [fact sheet], August 2002 [cited 24 October 2002]. Available from http://epa.gov/region8/superfund/pdfs/ClarkForkRProposedPlanFactsheet.pdf.
[8] Comparison of 1947 aerial photographs and 2001 stream banks.
[9] Department of the Interior, U. S. Geological Survey, "Surface Water Data for Montana: Clark Fork Monthly Streamflow Statistics [table], October 2002 [cited 18 October 2002]. Available from http://waterdata.usgs.gov/mt/nwis/monthly?.

vegetation at Grant-Kohrs is of primary importance not only to the Ranch, but the Clark Fork system as a whole."[10]

In 1983, approximately 100 years after Anaconda smelter operations began and three years after its closure, the U. S. Environmental Protection Agency (EPA) placed the area surrounding the smelter on its Superfund National Priorities List. Since that time, investigations have been ongoing to determine the extent and severity of contamination. It has been estimated that over 65,000 acres of the south end of Deer Lodge Valley has been affected.[11] The Grant-Kohrs Ranch, which is part of the Clark Fork River Operable Unit, comprises approximately 3.5 of the 120 miles of river impacted by the contaminants, extending from Warm Springs Pond near Anaconda, to the Milltown Reservoir near Missoula.

Within the Grant-Kohrs Ranch NHS, slickens deposits account for approximately 8 acres within the riparian zone, predominantly along the river edges. Typically, these slickens are individually less than 0.5 acres in size.[12] The extent of the tailings contamination, however, is estimated to cover the entire floodplain.[13] This extent is attributable to several flood events, particularly the 1908 flood, which swelled the river and raised the water level high over the banks of the river channel.

In a 2002 toxic metals-pH impact study on riparian plant community structure on the Grant-Kohrs Ranch conducted by Peter Rice, it was determined that concentrations of metals, adjusted for pH, are strongly related to plant community composition in the Grant-Kohrs Ranch riparian zone. For instance, tufted hairgrass (*Deschampsia cespitosa*), redtop bentgrass, and Booth willow (*Salix boothii*) were found to be metal tolerant, while woundwort (*Stachys palustris*), Hoary cress (*Cardaria draba)*, Kentucy bluegrass (*Poa pratensis*), Quackgrass (*Agropyron repens*), and smooth brome, were found to be sensitive to the presence of metals. As a result, it has been determined that metal contamination has altered the plant communities of the riparian zone by favoring certain species at the expense of others.[14]

In August of 2002, the EPA published a proposed plan for cleanup of the Clark Fork River, which called for extensive work to stabilize streambanks, remove some of the worst contaminated areas, and treat other contaminated areas in place.[15] EPA expects to publish a Record of Decision for the CFROU in early 2004. Based on that document, the NPS will determine what additional activities, if any, will be needed beyond the EPA remedy to restore ranch resources to the condition that would have existed if not for the release of hazardous substances.[16]

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[10] Rice and Hardin, i.
[11] "About the Anaconda Company Smelter Site: Site History." In Clark Fork Technical Assistance Committee [electronic bulletin board], August 2002 [cited 24 October 2002]. Available from http://www.clarkforkoptions.org/SiteAnaconda.asp.
[12] Rice and Ray,1984, v.
[13] Area analysis performed on Geographic Information Systems map data provided by the National Park Service: *Tailings Extent Introduced by the 1908 Flood at Grant-Kohrs Ranch National Historic Site, Montana* [electronic file online], Grant-Kohrs Ranch NHS GIS Program, compiled 2001 (Accessed 16 September 2002). Metadata available from World Wide Web: (http://www.nps.gov/gis/metadata/grko/ grko_tailingsext.html); statistical information supplemented by Greg Nottingham, NPS Superfund coordinator.
[14] Peter M. Rice, "Toxic Metal-pH Impact on Riparian Plant Community Structure at Grant-Kohrs Ranch," Need to get Moore 2001, 2002 (Missoula: University of Montana, 2002).
[15] U. S. Environmental Protection Agency, "Superfund Program Clean-up Proposal: Clark Fork River Operable Unit of the Milltown Reservoir/Clark Fork River Superfund Site [fact sheet], August 2002 [cited 24 October 2002]. Available from http://epa.gov/region8/superfund/pdfs/ClarkForkRProposedPlanFactsheet.pdf.
[16] Written comments provided by NPS personnel for 50% draft review (May 12, 2003).

Constructed Water Features
[see Map EC-35 at the end of this section]

The Kohrs-Manning Ditch taps off the Clark Fork River just south of the park boundary. From here the ditch flows through the riparian woodland, passing through a flume/headgate over Cottonwood Creek on its way to the Clark Fork River. An irrigation headgate located along Johnson Creek provides water to Johnson Ditch.

The pump located along the Clark Fork River, which was installed in 1960, provides water to a 450 foot long irrigation ditch along the west side of the river, located within the riparian woodland. This ditch, as well as two other short (apparently spring-fed ditches) located near spring-fed slough no longer appear to be in use.

Circulation
[see Map EC-34 at the end of this section]

Johnson Creek and Cottonwood Creek were key features of an interpretive trail constructed on the ranch in 1993. This "Cottonwood Trail" started at the visitor center, or from the front of the ranch home, and traveled south along the railroad corridor before passing through the Johnson Creek riparian woodland. From there, it continued along the west edge of the railroad corridor until reaching Cottonwood Creek, where it turned west to follow the creek to the Kohrs-Manning Ditch. This trail was recently abandoned by the NPS, as it could not be maintained.

Near the visitor center and ranch home, the trail is a six foot wide paved asphalt path, with one foot wide mown grass shoulders on either side. Shortly after passing the railroad underpass, the trail is no longer paved. Along the railroad bed the trail turns into an informal corridor that shows evidence of use as a worn road and footpath. After turning into the Johnson Creek riparian area, the trail becomes much more natural in character, becoming only a grassy path lined by jack leg fencing and interpretive signage (see Photo 3-7-8).

The Clark Fork River Bridge Road is an approximately 12 foot wide gravel road that extends from the south side of Johnson Creek to the Kohrs Ditch on the west side of the ranch (see Photo 3-7-9). It crosses the Clark Fork River, as well as the Kohrs Manning Ditch and natural slough via bridges (these features are discussed in greater detail below).

Views and Vistas
[see Map EC-35 at the end of this section]

Views of and within the riparian woodland provide contrast to the views found throughout the rest of the ranch. Within the riparian area, the trees, shrubs, and grasses provide both filtered and framed views. The Clark Fork River, Cottonwood Creek, and Johnson Creek are dynamic water elements that serve as focal points within this area.
Views of the riparian woodland from other areas of the ranch are defined by the contrast between the dense vegetation found along the river, and the hayfields and open grassland of the upland areas. Likewise, the species contained within the riparian woodland (particularly cottonwoods and willows) provide contrast in color and texture with the surrounding grassland. Views of the sewage treatment pond earthen embankments are prominent from within the northern portion of the riparian zone, as is the cattail-laden wetland. Views of the western foothills are also very prominent in this area.

Buildings and Structures
[see Map EC-35 at the end of this section]

The following buildings and structures information has been derived from the National Register of Historic Places Registration Form, the Grant-Kohrs Ranch NHS Historic Structures Report, and supplemented by field observations during the 2002 site visit (see bibliography for full citations).

Within the Riparian Woodland zone, buildings and structures relate to water; bridges to cross the river and wet areas, and a pump house to move water to various locations.

Built in 1930, the **Slough Bridge** (HS-90), (see Photo 3-7-10) is located west of the Grant-Kohrs Home Ranch complex. The wooden bridge is an extension of the two track access road that leads from the Kohrs-Manning ditch bridge and spans the wet area between the Clark Fork River and Johnson Creek. Between the wood abutments, eight large posts support the bridge deck which is constructed of 3-inch by 12-inch planks. There are no side rails. Jack leg fencing is located on both sides.

West of the Slough Bridge lies the **Clark Fork Bridge** (HS-89), (see Photo 3-7-11) also built in 1930. The bridge is on the east edge of the western pastures. The Clark Fork Bridge is a pony truss bridge with 10" timber piles and concrete retaining walls. Log and timber joists support the 3-inch by 12-inch deck planking.

A **pump house** (HS-87), one of three within the CLR study boundary, is located on the southern edge of the southwestern pasture, on the west bank of the Clark Fork River, (see Photo 3-7-12). Built in 1960, the pump house is a square, one-story, cast-in-place concrete building with a flat roof, set on a poured concrete foundation. Eight-inch horizontal boards were used to form the building. A louvered metal vent is centered high on each side of the building. Access is gained through a metal hatch in the roof. Electrical conduits lead to a metal utility pole attached to the southwest corner of the building. Near the pump house, a drum for screening debris is set into the river. After passing through the drum, water flows into a sump under the pump house and then up through the pump and into the delivery pipe. This pipe supplies water to the Kohrs Ditch further to the west.

Objects and Small-scale Features
[see Map EC-36 at the end of this section]

Within the Riparian Woodland component landscape, there are several types of fences and gates. Fences and gates are used to demarcate fence and road boundaries, prevent access to the river, and to protect features.

The most prevalent type of fence within this landscape is the **Metal Post and Barbed Wire Fence.** This fence type surrounds much of the riparian woodland corridor. The fence consists of thin metal posts supporting five (sometime six) strands of barbed wire. Metal Post and Barbed Wire fencing enclosures were installed in 2001 to protect groundwater and soil pore water monitoring nests (tensiometers, lysimeters, and piezometers) during Superfund investigations (see Photo 3-7-13). These will be removed during future site restoration.[17]

[17] Greg Nottingham, NPS 95% CLR draft review comments (March 12, 2004).

Wood Post and Woven Wire Fence, (see Photo 3-7-14) is also located within this landscape. The majority of this fence type is found on either side of the Clark Fork River Bridge Road. In general, the fence consists of un-milled wood posts or peeled logs supporting a wire mesh component. Variations of this fence type include metal posts or a combination of wood and metal posts supporting wire mesh. Sheep Wire fence is commonly referred to as woven wire fence. This fence is also common throughout the ranch. It is bundled in a large roll and when stretched, it has a strong wire top and bottom. Wire squares are larger on top and smaller on the bottom.

Closer to the developed and interpreted areas of the ranch is the **Jack-Leg fence.** This fence type is similar to other Jack-Leg fences found throughout the CLR study boundary. Two wood posts are crossed at the top to form an X-shape. One horizontal rail rests in the crux of the X while 3 more rails are attached to the exterior of one post to form an angled fence. A fifth rail is attached to the lower side of the opposite pole for added strength and security. All wood members of the fence are un-milled and unfinished.

A short section of **Double-Rail and Post fence,** (see Photo 3-7-15) is located in the southern section of the component landscape and on the western edge of the Clark Fork River. The fence has two wooden, horizontal rails supported by upright, wooden posts. The ends of the rails are overlapped at the posts to create a stacked appearance.

Metal Post and Hog Wire Fence, (see Photo 3-7-16) is also used to protect small scale features. The woven fence consists of a stiff, metal, mesh fence supported by thin metal posts. These fences enclose approximately 30 small rectangular areas along the riparian zone to protect Superfund investigations (geochemistry, microbial respiration, phytotoxicity, and plant community composition) and will be removed during restoration activities.[18]

A **4-rail Stacked-end fence** is found along the edge of the Home Ranch landscape. Four round rails extend between log posts on one side of the fence while two more rails are placed on the lower half of the fence on the other side. At each post, the rails for one section are placed alternately with the rails for the next section, creating a stacked appearance. This fence can also be found in other areas of the ranch with 5 or 6 rails and varying rail and post size.

A **5-rail Braced Gate,** (see Photo 3-7-17) is located along the Clark Fork River Bridge Road. The gate could be used to close off the road from vehicular traffic but was open during fieldwork observations. This gate has a hinge-post almost twice the height of the gate and has a long, diagonal brace leading from the top of the hinge-post to the opposite corner of the gate. This brace prevents and corrects sagging. The hinge-post is attached to a taller post that has diagonal braces running from the top of the post to the Jack-Leg fence and ground for stability.

A **metal pump drum** (see Photo 3-7-18) for screening debris is set into the river to draw water to the pump house. This drum is an approximately four foot long cylinder supported by metal braces. Metal mesh screens cover the outer surface.

Health warning signs are also located within the riparian woodland along the Clark Fork River (see Photo 3-7-19). These black and white signs are approximately 18" x 24" with red lettering, stating "Health Warning, Hazardous Mine Waste Materials Present. Ingestion, inhalation, or physical contact with mine waste soils located next to the Clark Fork River may be harmful to your health." They were installed in 1998 to warn recreationists using the river corridor (swimming, tubing, rafting, fishing, etc...) of the potential health risks associated with mining

[18] Greg Nottingham, NPS 95% CLR draft review comments (March 12, 2004).

wastes in soils and sediments of the Clark Fork River and its floodplain. These signs are distributed in areas where river users have easy access to areas of exposed tailings. The most prominent recreational area is the river bridge where grade school and high school-aged kids swim. It is one of the deepest points on the Clark Fork River and is located adjacent to a large slicken. For that reason, two signs are posted in and around that location, one on the bridge road fence toward the road, the other on the nearest upstream bend, facing the river. A third sign is located on the inside bend of the next major meander downstream of the bridge, also facing the river and located on the edge of a smaller slicken.[19]

Small **wooden signs**, approximately 4" x 8" are located near the slough bridge (see Photo 3-7-20). These signs are painted brown, with white lettering, and notify travelers of the "4 ton" weight limit.

Small **wooden interpretive marker posts**, approximately 4-5 inches in diameter, mark the interpretive points of the Cottonwood Trail (see Photo 3-7-21). The tops of these posts are mitered at an approximate 45 degree angle, and the number of the interpretive marker is engraved into the top.

A **wooden bench** is located within the Johnson Creek riparian woodland. It marks a rest stop along the Cottonwood Trail (see Photo 3-7-22). Constructed of wood, the bench seat is a half hewn log, and rests on cut logs.

Missing & Archeological Resources
[see Map EC-37 at the end of this section]

Based on information provided in the park's GIS database, there are several historic features documented in this area. These features include **wagon tongues**, **wagon wheels**, **old logs**, and the remains of what has been identified as an **old bridge**. A **historic dump** may also be located here. Other features relating to the site's irrigation history, such as the remains of a **berm dam** and **old wooden flume**, have also been identified. The date of origin of these features is unknown. An archeological survey of the riparian area was completed in the summer of 2003 by the University of Montana.[20]

[19] Personal correspondence with Greg Nottingham, Grant-Kohrs Ranch NHS Superfund Coordinator (June 11, 2003).
[20] Written comments provided by NPS personnel for 50% draft review (May 12, 2003).

JMA, October 2002

Photo 3-7-1 : (Q-14) Clark Fork River with views of ranch in background.

JMA, October 2002

Photo 3-7-2 : (P-13) Three natural springs source a 300 foot long slough located to the west of the Clark Fork River.

JMA, October 2002

Photo 3-7-3 : (RE-19) Cottonwood Creek.

JMA, October 2002

Photo 3-7-4 : (I-23) Riparian vegetation and remnant fencing along the Clark Fork River.

JMA, October 2002

Photo 3-7-5 : (H-11) Cattails in the abandoned sewage lagoon.

JMA, October 2002

Photo 3-7-6 : (Q-12) While some areas of the riparian woodland are quite dense with trees and shrubs, other areas are open grassland.

JMA, October 2002

Photo 3-7-7 : (Q-13) Slickens.

JMA, October 2002

Photo 3-7-8 : (RF-02) Cottonwood trail.

JMA, October 2002

Photo 3-7-9 : (Q-18) Clark Fork River Bridge Road with Jack-Leg Fencing on either side.

JMA, October 2002

Photo 3-7-10 : (Q-21) Slough Bridge (HS-90).

JMA, October 2002

Photo 3-7-11 : (Q-08) Clark Fork Bridge (HS-89).

JMA, October 2002

Photo 3-7-12 : (P-15) Pumphouse (HS-87).

JMA, October 2002

Photo 3-7-13 : (Q-10) Metal post and barbed wire fence (ca. 2000-2001) surrounds test pipes in various locations along the Clark Fork River.

JMA, October 2002

Photo 3-7-14 : (Q-05) Wood Post and Woven Wire Fence.

JMA, October 2002

Photo 3-7-15 : (P-19) Double Rail and Post Fence.

JMA, October 2002

Photo 3-7-16 : (Q-09) Metal Post and Hog Wire Fence. There are 30 sections of this kind of fence in the riparian area (ca. 2001).

JMA, October 2002

Photo 3-7-17 : (Q-17) 5-Rail Braced Gate.

JMA, October 2002

Photo 3-7-18 : (P-16) Metal Pump Drum.

JMA, October 2002

Photo 3-7-19 : (Q-16) Health Warning Signs.

JMA, October 2002

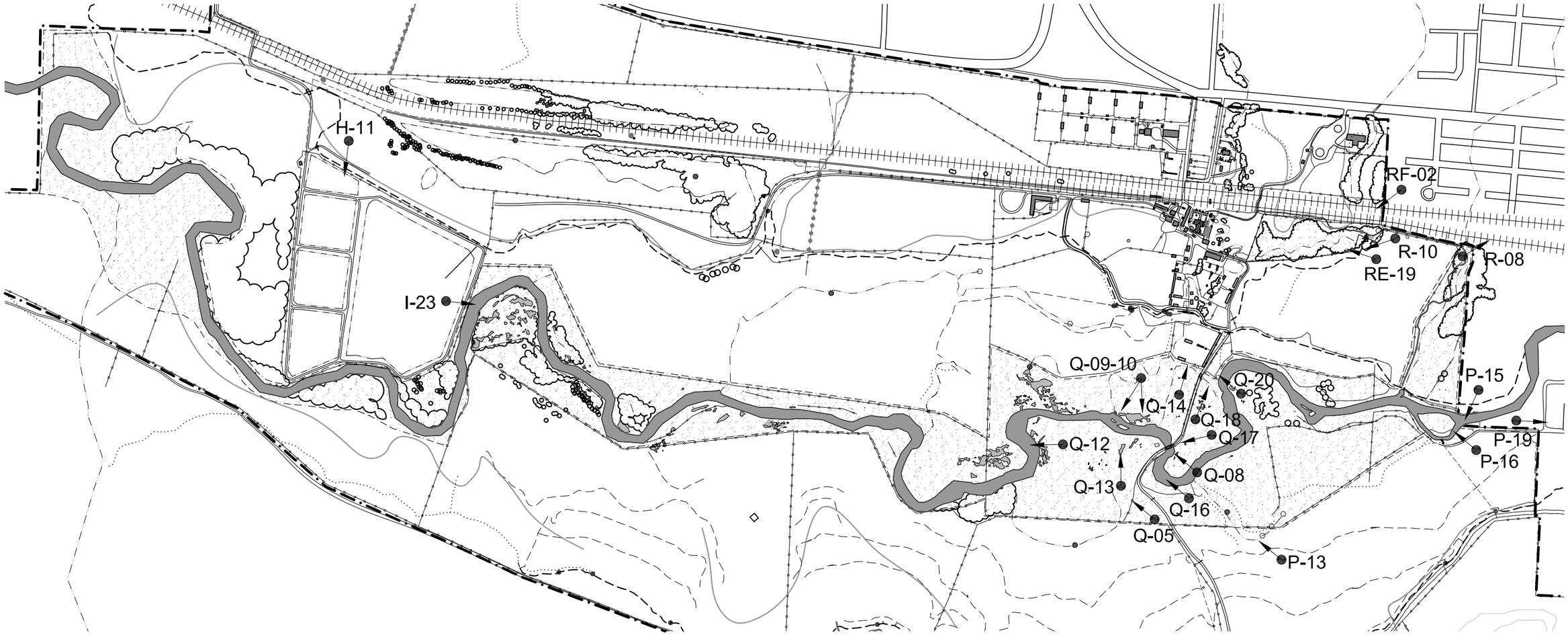
Photo 3-7-20 : (Q-20) Wooden signs.

JMA, October 2002

Photo 3-7-21 : (R-8) Wood post along interpretive trail.

JMA, October 2002

Photo 3-7-22 : (R-10) Wooden bench along Johnson Creek.



Map Sources: Base mapping referenced to Grant-Kohrs Ranch National Historic Site 1994 aerial photographs and Montana 1:24,000 scale State Plane DRG quadrangles. GIS data was exported into Autocad format for production of base maps and further further detailed with additional data collected in the field.

The following data was provided by the National Park Service, Grant-Kohrs Ranch National Historic Site GIS Program (shapefile format), which was compiled 1998 and updated/field-checked by OCULUS/JMA during the October 2002 site visit: fences and gates; boundary lines; utility lines; fire hydrants; irrigation ditches, headgates, pipes, and risers; culverts; river boundaries; roads; railroad tracks; unvegetated slickens and tailings; fields; trails; cottonwood trees; beaver lodges and dams; hydrology; and groundwater monitoring wells. Metadata for this data is avaliable from World Wide Web: [http://www.nps.gov/gis/metadata/grko/]. Wetlands, hypsography (topography), and Montana 1:24,000 scale State Plane DRG quadrangles were derived from Montana State Library Natural Resource Information System, metadata available from: [http://nris.state.mt.us/gis/datalist.html].

Legend:

- Roads
- Vegetation
- Bench
- Fences
- Streams/Sloughs
- Railroad
- Buildings/ Structures
- Springs
- Old Ditches
- Main Ditches
- Lateral Ditches
- Component Landscape Boundary Line
- GRKO Boundary Line
- Beaver Lodges

Scale: 1" = 800'

A/E FIRM

PRIME
NAME: Susan Maxman Architects
CITY, STATE: Philadelphia, PA

SUBCONTRACTOR
NAME: John Milner Assodates, Inc.
CITY, STATE: Charlottesville, VA

DESIGNED:
DRAWN: ADF
TECH. REVIEW: KLS, RMM
DATE: JULY 2004

SUB SHEET NO. P-9

EXISTING CONDITIONS INVENTORY

RIPARIAN WOODLAND

PHOTO STATION POINT MAP

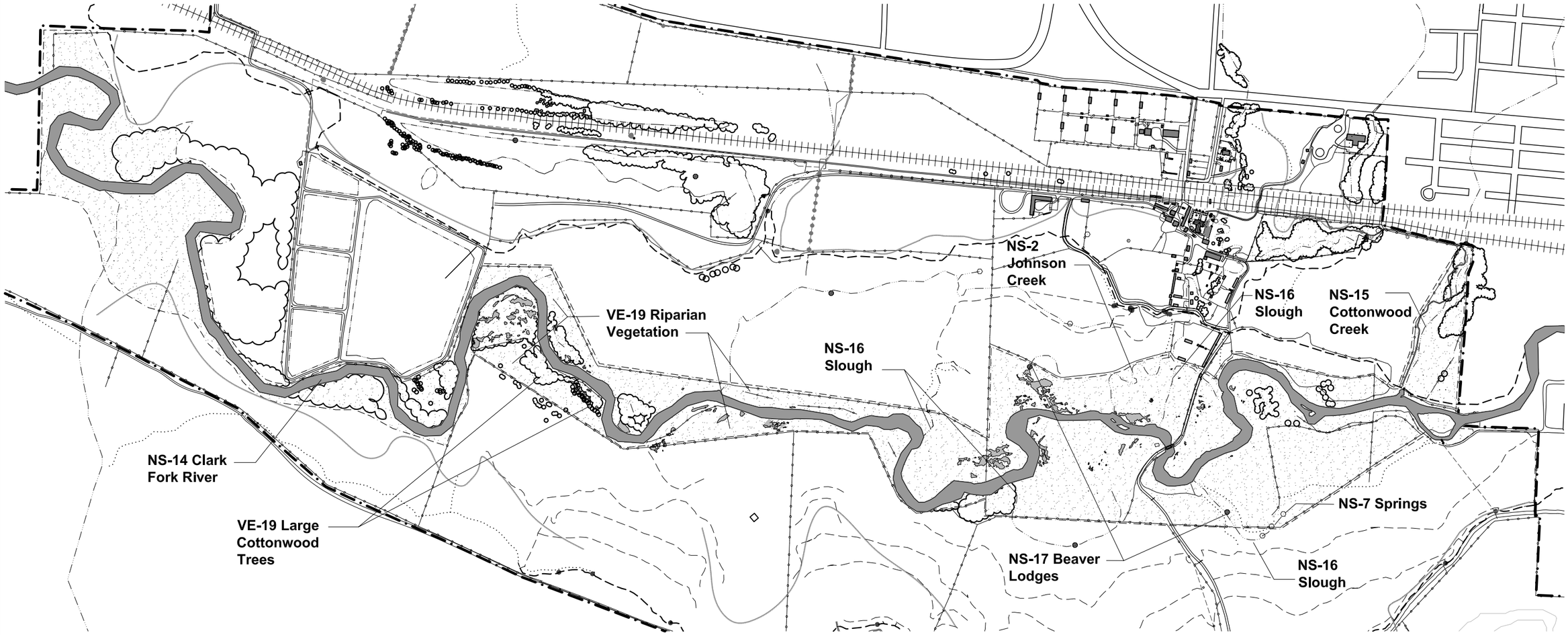
GRANT-KOHRS RANCH NATIONAL HISTORIC SITE

DRAWING NO.

PKG. NO.

SHEET

OF



Map Sources: Base mapping referenced to Grant-Kohrs Ranch National Historic Site 1994 aerial photographs and Montana 1:24,000 scale State Plane DRG quadrangles. GIS data was exported into Autocad format for production of base maps and further further detailed with additional data collected in the field.

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Legend:

- Roads
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- Main Ditches
- Lateral Ditches
- Component Landscape Boundary Line
- GRKO Boundary Line
- Beaver Lodges

Scale: 1" = 800'

A/E FIRM

PRIME
NAME: Susan Maxman Architects
CITY, STATE: Philadelphia, PA

SUBCONTRACTOR
NAME: John Milner Assocdates, Inc.
CITY, STATE: Charlottesville, VA

DESIGNED:

DRAWN: JLB, WMW

TECH. REVIEW: KLS, RMM

DATE: JULY 2004

SUB SHEET NO. EC-33

EXISTING CONDITIONS INVENTORY

RIPARIAN WOODLAND

NATURAL SYSTEMS AND VEGETATION

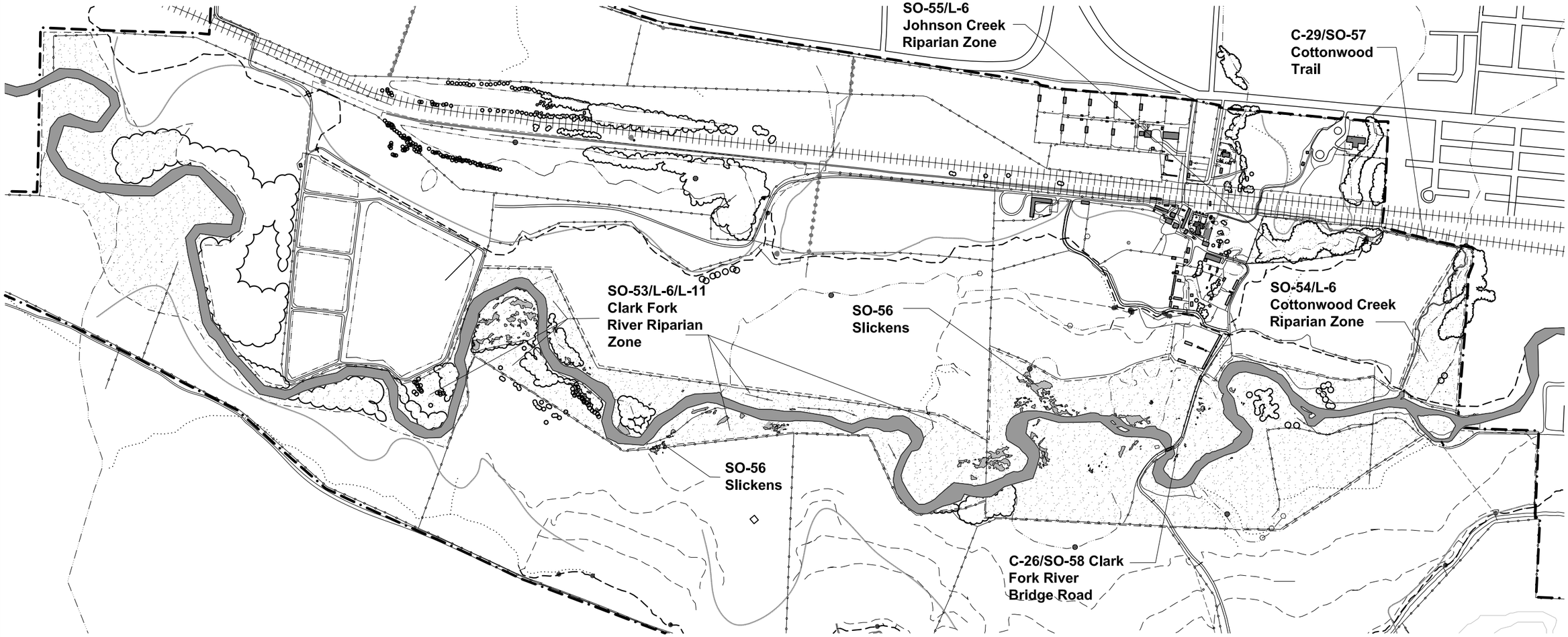
GRANT-KOHRS RANCH NATIONAL HISTORIC SITE

DRAWING NO.

PKG. NO.

SHEET

OF



Map Sources: Base mapping referenced to Grant-Kohrs Ranch National Historic Site 1994 aerial photographs and Montana 1:24,000 scale State Plane DRG quadrangles. GIS data was exported into Autocad format for production of base maps and further further detailed with additional data collected in the field.

The following data was provided by the National Park Service, Grant-Kohrs Ranch National Historic Site GIS Program (shapefile format), which was compiled 1998 and updated/field-checked by OCULUS/JMA during the October 2002 site visit: fences and gates; boundary lines; utility lines; fire hydrants; irrigation ditches, headgates, pipes, and risers; culverts; river boundaries; roads; railroad tracks; unvegetated slickens and tailings; fields; trails; cottonwood trees; beaver lodges and dams; hydrology; and groundwater monitoring wells. Metadata for this data is avaliable from World Wide Web: [http://www.nps.gov/gis/metadata/grko/]. Wetlands, hypsography (topography), and Montana 1:24,000 scale State Plane DRG quadrangles were derived from Montana State Library Natural Resource Information System, metadata available from: [http://nris.state.mt.us/gis/datalist.html].

Legend:

- Roads
- Vegetation
- Bench
- Fences
- Streams/Sloughs
- Railroad
- Buildings/ Structures
- Springs
- Old Ditches
- Main Ditches
- Lateral Ditches
- Component Landscape Boundary Line
- GRKO Boundary Line
- Beaver Lodges

Scale: 1" = 800'

A/E FIRM

PRIME
NAME: Susan Maxman Architects
CITY, STATE: Philadelphia, PA

SUBCONTRACTOR
NAME: John Milner Assodates, Inc.
CITY, STATE: Charlottesville, VA

DESIGNED:

DRAWN: JLB, WMW

TECH. REVIEW: KLS, RMM

DATE: JULY 2004

SUB SHEET NO. EC-34

EXISTING CONDITIONS INVENTORY

RIPARIAN WOODLAND

CIRCULATION, SPATIAL ORGANIZATION, AND LAND-USE

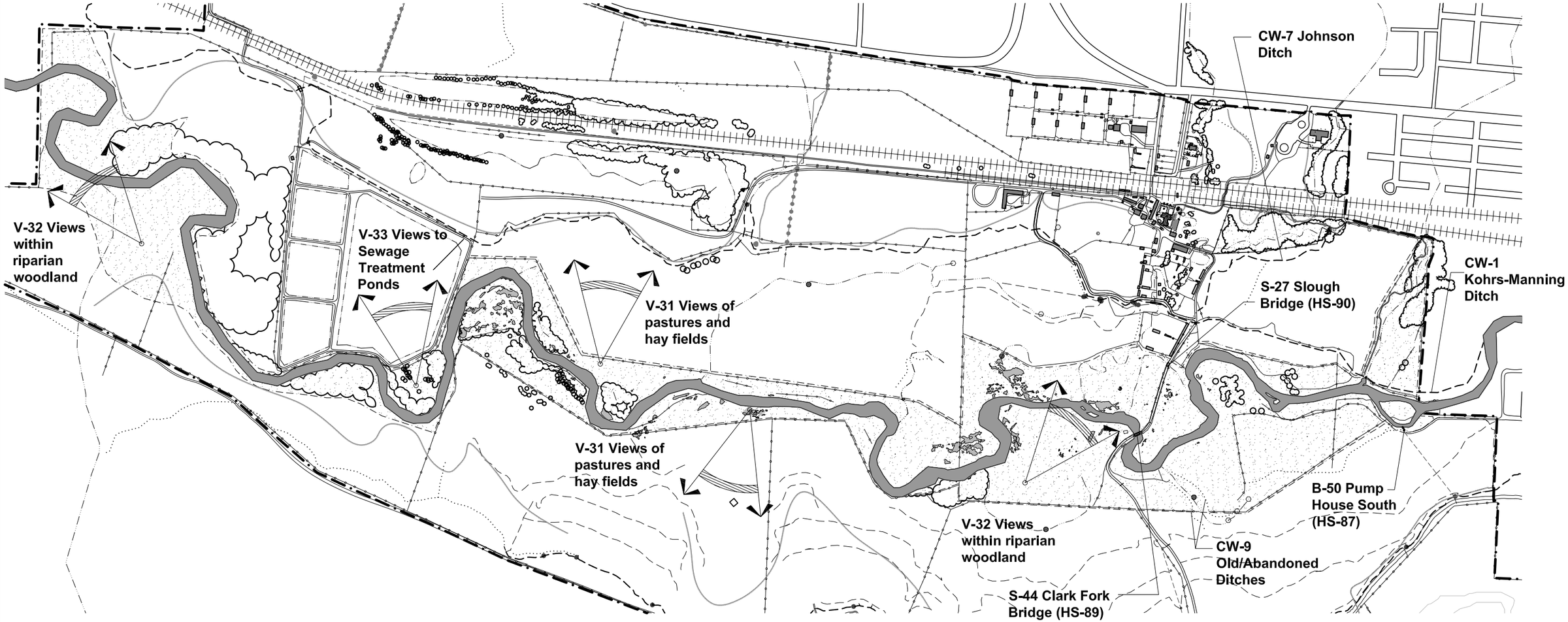
GRANT-KOHRS RANCH NATIONAL HISTORIC SITE

DRAWING NO.

PKG. NO.

SHEET

OF



Map Sources: Base mapping referenced to Grant-Kohrs Ranch National Historic Site 1994 aerial photographs and Montana 1:24,000 scale State Plane DRG quadrangles. GIS data was exported into Autocad format for production of base maps and further further detailed with additional data collected in the field.

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Legend:

- Roads
- Vegetation
- Bench
- Fences
- Streams/Sloughs
- Railroad
- Buildings/ Structures
- Springs
- Old Ditches
- Main Ditches
- Lateral Ditches
- Component Landscape Boundary Line
- GRKO Boundary Line
- Beaver Lodges

Scale: 1" = 800'

A/E FIRM

PRIME
NAME: Susan Maxman Architects
CITY, STATE: Philadelphia, PA

SUBCONTRACTOR
NAME: John Milner Assocates, Inc.
CITY, STATE: Charlottesville, VA

DESIGNED:
DRAWN: JLB, WMW
TECH. REVIEW: KLS, RMM
DATE: JULY 2004

SUB SHEET NO. EC-35

EXISTING CONDITIONS INVENTORY

RIPARIAN WOODLAND

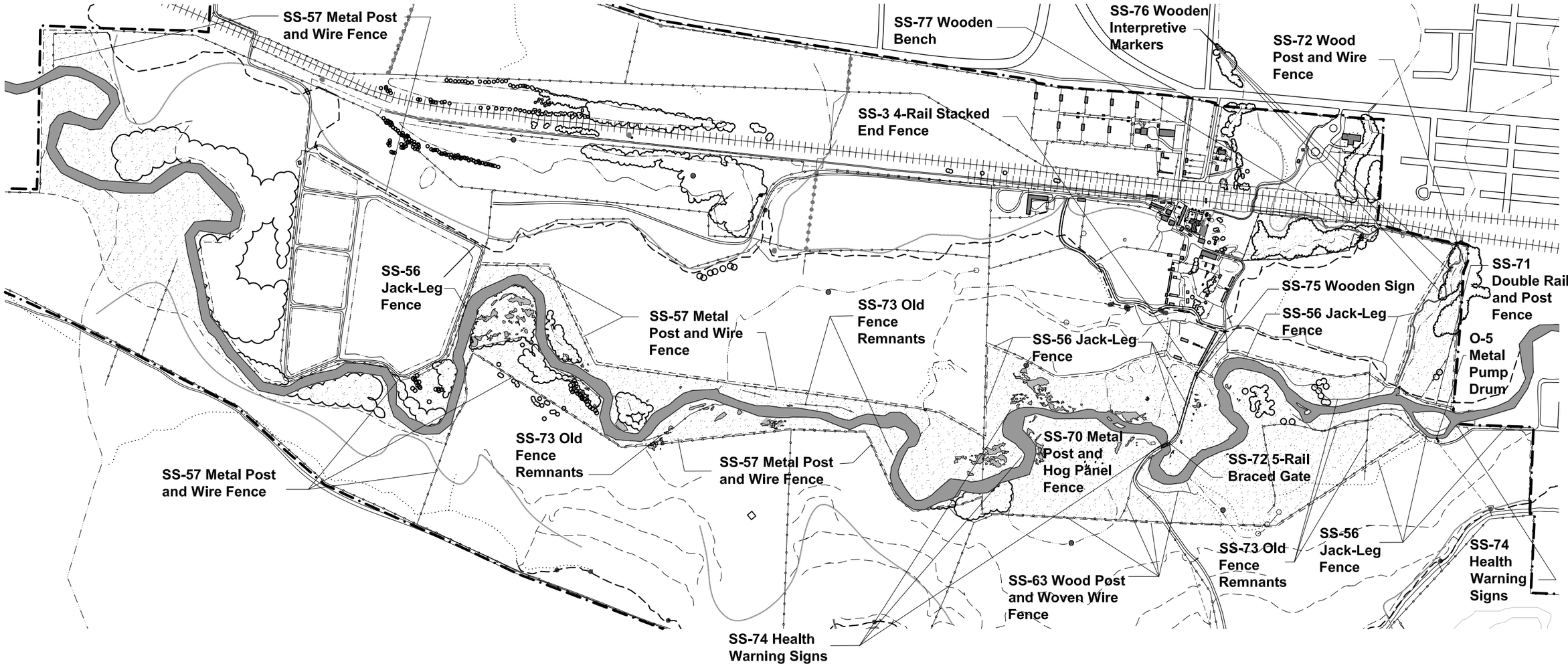
BUILDINGS AND STRUCTURES, CONSTRUCTED WATER FEATURES, AND VIEWS

GRANT-KOHRS RANCH NATIONAL HISTORIC SITE

DRAWING NO.

PKG. NO.

SHEET OF



Map Sources: Base mapping referenced to Grant-Kohrs Ranch National Historic Site 1994 aerial photographs and Montana 1:24,000 scale State Plane DRG quadrangles. GIS data was exported into Autocad format for production of base maps and further further detailed with additional data collected in the field.

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Legend:

- Roads
- Vegetation
- Bench
- Fences
- Streams/Sloughs
- Railroad
- Buildings/ Structures
- Springs
- Old Ditches
- Main Ditches
- Lateral Ditches
- Component Landscape Boundary Line
- GRKO Boundary Line
- Beaver Lodges

Scale: 1" = 800'

A/E FIRM

PRIME
NAME: Susan Maxman Architects
CITY, STATE: Philadelphia, PA

SUBCONTRACTOR
NAME: John Milner Assodates, Inc.
CITY, STATE: Charlottesville, VA

DESIGNED:
DRAWN: JLB, WMW
TECH. REVIEW: KLS, RMM
DATE: JULY 2004

SUB SHEET NO. EC-36

EXISTING CONDITIONS INVENTORY

RIPARIAN WOODLAND

OBJECTS AND SMALL-SCALE FEATURES

GRANT-KOHRS RANCH NATIONAL HISTORIC SITE

DRAWING NO.

PKG. NO.

SHEET

OF

[location of features removed from this graphic]

Map Sources: Base mapping referenced to Grant-Kohrs Ranch National Historic Site 1994 aerial photographs and Montana 1:24,000 scale State Plane DRG quadrangles. GIS data was exported into Autocad format for production of base maps and further further detailed with additional data collected in the field.

The following data was provided by the National Park Service, Grant-Kohrs Ranch National Historic Site GIS Program (shapefile format), which was compiled 1998 and updated/field-checked by OCULUS/JMA during the October 2002 site visit: fences and gates; boundary lines; utility lines; fire hydrants; irrigation ditches, headgates, pipes, and risers; culverts; river boundaries; roads; railroad tracks; unvegetated slickens and tailings; fields; trails; cottonwood trees; beaver lodges and dams; hydrology; and groundwater monitoring wells. Metadata for this data is avaliable from World Wide Web: [http://www.nps.gov/gis/metadata/grko/]. Wetlands, hypsography (topography), and Montana 1:24,000 scale State Plane DRG quadrangles were derived from Montana State Library Natural Resource Information System, metadata available from: [http://nris.state.mt.us/gis/datalist.html].

Legend:

- Roads
- Vegetation
- Bench
- Fences
- Streams/Sloughs
- Railroad
- Buildings/ Structures
- Springs
- Old Ditches
- Main Ditches
- Lateral Ditches
- Component Landscape Boundary Line
- GRKO Boundary Line
- Beaver Lodges

Scale: 1" = 800'

A/E FIRM PRIME NAME: Susan Maxman Architects CITY, STATE: Philadelphia, PA SUBCONTRACTOR NAME: John Milner Assodates, Inc. CITY, STATE: Charlottesville, VA	DESIGNED: DRAWN: JLB, WMW TECH. REVIEW: KLS, RMM DATE: JULY 2004	SUB SHEET NO. EC-37	EXISTING CONDITIONS INVENTORY RIPARIAN WOODLAND **MISSING FEATURES** GRANT-KOHRS RANCH NATIONAL HISTORIC SITE	DRAWING NO. PKG. NO. SHEET OF